3

Demand Management: Water Conservation

Demand management through water conservation is an important element of water supply planning and entails reducing the quantity of water required to meet demands through water use efficiency improvements and the prevention or reduction of unnecessary uses or losses of water. Water conservation contributes to the sustainability of water supply resources. Section 373.709(2), Florida Statutes (F.S.), requires that water conservation be considered when determining if the total capacity of the water supply development project options included in a water supply plan (**Chapter 8**) are greater than the increase in projected demands for the planning horizon (**Chapter 2**).

TOPICS

- Conservation Measures
- Conservation Programs
- Regulatory Initiatives
- Potential for Water Conservation Savings
- Conclusions

Conservation and efficiency measures should be maximized, regardless of the water source, before more costly water supply development options are implemented. Water conservation can reduce, defer, or eliminate the need to develop new water supply sources to meet current or future demands, which is comparable with expanding the existing water supply. Moreover, conservation and demand management have been shown to reduce costs to utilities and rate payers over the long term (Chesnutt et al. 2018, Feinglas et al. 2013). Improving water use efficiency can also reduce operational costs for most other users.

This chapter describes water conservation measures and programs and provides an estimate of potential water savings (demand reduction) achievable by 2045 in the Lower West Coast (LWC) Planning Area. Additional conservation information can be found in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021a), in the Comprehensive Water Conservation Program (SFWMD 2008), and on the SFWMD website (https://www.sfwmd.gov/conserve).

CONSERVATION MEASURES

The average per capita water use rate in the LWC Planning Area has decreased from about 177 gallons per capita per day (gpcd) in 2000 to about 123 gpcd in 2020. However, more recently over the last 5 years, per capita water use has remained relatively stable, between approximately 123 gpcd and 127 gpcd. The leveling off of per capita water use is thought to

be mostly due to a reliance on passive water savings, which result from the introduction of water-efficient fixtures and appliances into the marketplace, replacing older devices with more water-efficient models. Federal, state, and local codes and standards foster the development and use of more efficient devices, increasing passive savings. However, depending solely on passive savings will delay or exclude substantial conservation savings potential. Therefore, additional conservation measures and programs are necessary to encourage the use of high-efficiency equipment or improved water use behaviors that yield water savings, including increased outreach, education, and messaging to water users. Local governments, utilities, and large water users are encouraged to research which types of programs would be most appropriate and cost-effective for their residents and specific user groups and to develop goal-based water conservation plans that include development of public education and messaging. Cost-share funding and other collaborative opportunities may be available to help implement conservation strategies and programs. The following subsections include a brief description of conservation measures that can be implemented for outdoor and indoor water use applications.

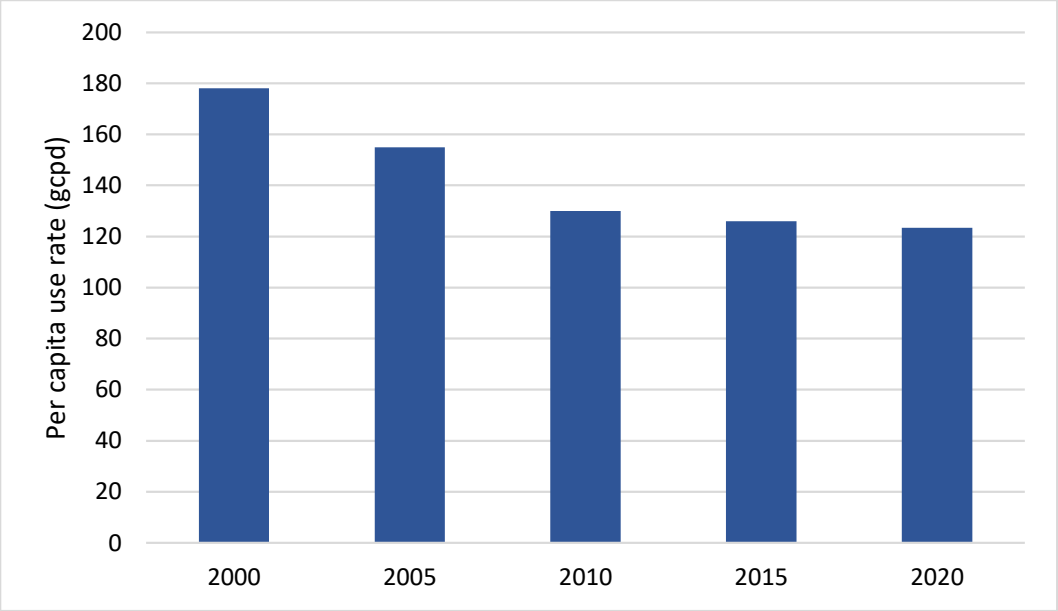

Figure 3-1. Net (finished) water per capita use rate (in gallons per capita per day) within the Lower West Coast Planning Area.

Outdoor Water Use (Irrigation)

A significant share of water used outdoors in the LWC Planning Area is for irrigation. Lawns and landscapes are irrigated by residential and commercial property owners, while irrigation of food and other commodity crops is practiced by agricultural water users. Many irrigation efficiency principles are common across these user groups; however, patterns and scales of use, system design, hardware and components, and operator knowledge can vary widely.

Agriculture

Many alternatives are available for improving irrigation efficiency and conserving water in agricultural operations. Typically, agricultural water conservation measures fall under three categories: (1) converting from one irrigation method (or system type) to a more efficient one; (2) improving the precision irrigation management capabilities of the system; and (3) implementing best management practices. Real-time information on soil moisture and weather conditions, along with remote operation to allow quick irrigation changes in response to changing weather, can help adjust when water is delivered to precisely meet crop needs. Hardware and technology that can improve system management, reduce water quantities required to meet crop needs, and minimize water losses include the following:

- Flowmeters
- Weather stations
- Soil moisture sensors
- Variable-frequency pump drives
- Automated control systems
- Best management practices (e.g., laser leveling, irrigation system maintenance)

Urban

In South Florida, where irrigation occurs year-round, the largest portion of water used by urban water users served by utilities often is for irrigation. Moreover, the United States Environmental Protection Agency estimates approximately 50% of water used outdoors is wasted due to inefficient watering methods and systems. Therefore, improvements to irrigation efficiency are considered a primary target for conserving water used by urban water users.

Irrigation efficiency improvements can be achieved at single- and multi-family residences, commercial and institutional properties, recreational areas (e.g., parks, athletic fields, golf courses), and other landscaped areas (e.g., roadway medians) by replacing outdated irrigation systems and timers. Automatic controllers should be tested and shown to meet the United States Environmental Protection Agency's WaterSense program specifications for water efficiency and performance. More information on the WaterSense program and labeled irrigation controllers is available at https://www.epa.gov/watersense. All automatic lawn and landscape irrigation systems must be properly equipped with technology that inhibits or interrupts the system's operation during periods of sufficient rainfall (Section 373.62, F.S.).

Golf courses typically are irrigated with a high degree of efficiency. However, opportunities to improve efficiency may exist using many of the same types of hardware and technology as described above. Additional practices for efficient golf course water use can be found in *Best Management Practices for the Enhancement of Environmental Quality on Florida Golf Courses* published by the Golf Course Superintendents Association of America (2021) for golf course managers https://www.gcsaa.org/environment/bmp-planning-guide.

Indoor Water Use

Another area of potential conservation savings is indoor water use in single- and multi-family residences and commercial/institutional buildings (e.g., office buildings, restaurants, movie theaters, long-term care facilities, hospitals). Potential measures include detecting and repairing water leaks and replacing older, inefficient plumbing fixtures (e.g., toilets, urinals, faucets, showerheads) with models that have been tested and shown to meet the WaterSense program specifications for water efficiency and performance. Older, inefficient appliances can be replaced with water-efficient models that have received the ENERGY STAR label. For more information on the ENERGY STAR program and to find labeled products, visit https://www.energystar.gov.

Common water efficiency improvement measures for commercial and industrial users are outlined in the SFWMD's (2013) *Water Efficiency Audit Guide*, which is discussed in greater detail in the 2021-2024 Support Document (SFWMD 2021a). Measures for improving water efficiency in non-residential settings may be applicable to specific operations or facilities such as autoclaves in hospitals; pre-rinse spray valves, food steamers, and waste grinders in restaurants; heating, ventilation, and air conditioning (HVAC) system efficiency upgrades; converting water-based cooling devices to air-based; and water reuse/recycling in industrial operations. Other applicable measures may exist for specific industrial processes.

CONSERVATION PROGRAMS

Conservation programs help educate water users and facilitate adoption of effective water conservation measures (e.g., specific actions or hardware that improve water use efficiency). Utilities and local governments are the primary entities that develop and implement conservation programs. Other regional and state agencies may also assume a leadership role in promoting and providing cost-share funding for water conservation. Utilities and local governments are encouraged to analyze their service areas and jurisdictions to determine potential user groups and programs that may be most suitable for them. The following subsections contain brief descriptions of established conservation programs that may be applicable to different water use categories.

Education, Outreach, and Marketing

Although water savings attributed to education, outreach, and marketing campaigns are difficult to quantify, such campaigns are essential to reducing water use and instilling a lasting conservation ethic in businesses and communities. Developing a conservation ethic and educating water users enable people to know why conservation is important and necessary, what conservation measures are available, and how they can implement them. Campaigns usually are conducted by regional/local agencies or utilities and are designed to reach specific user groups (e.g., residents, schools, commercial properties), providing consistent and regular messaging.

The SFWMD maintains its commitment to water conservation education through distributing educational materials, conducting speaking engagements, and utilizing social media platforms to raise awareness about the necessity of saving water.

Cost-Share Funding Programs

SFWMD Cooperative Funding Program

The Water Conservation component of the SFWMD Cooperative Funding Program (CFP) seeks to support projects that improve water use efficiency and conservation. The CFP provides financial incentives to local governments and utilities, homeowners' associations, commercial entities, and agricultural operations to implement technology and hardware-based water conservation projects. Historically, funding for the CFP has come from both ad valorem taxes and the Florida Legislature through the Florida Department of Environmental Protection. CFP funding is considered annually during the SFWMD's budget development process. Since the 2017 LWC Plan Update, the SFWMD has provided approximately $3 million in water conservation funding for 60 projects Districtwide. Over the same period (Fiscal Year [FY] 2017 through FY2021), 3 water conservation projects were funded in the LWC Planning Area for a total of $40,000 and 0.08 million gallons per day (mgd) of water saved. Currently funded projects are listed in **Chapter 8**. The CFP is expected to continue although future funding levels are uncertain. The District's Governing Board has instituted that beginning in FY2023, local governments must have an adopted year-round irrigation ordinance that fully comports with the SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, Florida Administrative Code [F.A.C.]) in order to be eligible for alternative water supply or water conservation funding through the CFP. Additional information regarding the CFP can be found on the SFWMD's website (https://www.sfwmd.gov/doing-business-with-us/coop-funding).

SUCCESS STORY

Bonita Springs Utilities received $10,000 (total project cost $25,000) to fund a high-efficiency toilet rebate program that issued 251 rebates targeting older homes in its service area saving over 1.5 million gallons per year of potable water. The cost per 1,000 gallons saved was less than $0.90.

Environmental Quality Incentives Program

The Environmental Quality Incentives Program (EQIP), implemented through the United States Department of Agriculture – Natural Resources Conservation Service, promotes agricultural production and environmental quality. Financial and technical assistance is offered to participants to address natural resource concerns and deliver environmental benefits such as improved water and air quality, conserved groundwater and surface water, reduced soil erosion and sedimentation, and improved or created wildlife habitat. From FY2017 through FY2021, EQIP has provided $469,770 in funding for irrigation projects covering a total of 378 acres. EQIP is expected to continue although future funding levels are uncertain.

Certification and Recognition Programs

There are several national and statewide certification and recognition programs that direct builders, property owners, and building managers toward meeting environmentally friendly standards. Such programs include the Florida Green Building Coalition's green certification programs, the Florida Department of Environmental Protection's Green Lodging Program, the United States Green Building Council's Leadership in Energy and Environmental Design (LEED), and the Green Building Initiative's Green Globes Certification. These holistic programs typically include criteria affecting water use, energy efficiency, climate-adaptive landscaping, sustainable building material, site selection, indoor environmental quality, and greenhouse gas emissions.

INFO ⓘ

Florida-Friendly Landscaping means using low-maintenance plants and environmentally sustainable landscaping practices to conserve water, reduce pollution and erosion, and create wildlife habitat.

With respect to growing development and finite water resources, there are single-focus programs that target water use efficiency. These programs often are less expensive for builders and property managers than holistic ones. Two single-focus programs endorsed by all Florida water management districts are Florida Water Star and Florida-Friendly Yard Recognition. More information on these programs can be found on their individual program webpages and on the SFWMD's website (https://www.sfwmd.gov/conserve).

Other Programs

Agricultural Best Management Practices Program

The Florida Department of Agriculture and Consumer Services (FDACS) develops and adopts agricultural best management practices (BMPs) by rule for different types of agricultural operations. As of March 2022, there are 534,966 acres within the LWC Planning Area enrolled in the FDACS BMP program. All agricultural water users are encouraged to enroll in the FDACS BMP program and also to learn about the FDACS Agricultural-Environmental Leadership Award which recognizes environmentally innovative farming practices. Local governments and agencies should consider promoting these programs to agricultural operations.

Agricultural Mobile Irrigation Labs

The FDACS Mobile Irrigation Lab (MIL) program performs free evaluations of irrigation system efficiency on agricultural lands and makes recommendations for physical and operational improvements. Such recommendations may include modification of irrigation systems and equipment, alteration of irrigation scheduling, and other aspects of system management. Of the eight MILs operating in Florida, one (the Lower West Coast MIL) serves Charlotte, Collier, Glades, Hendry, and Lee counties.

Florida Automated Weather Network

The Florida Automated Weather Network (FAWN), operated by the University of Florida – Institute of Food and Agricultural Sciences (UF/IFAS), provides weather information throughout the state at 15-minute intervals. FAWN management tools provide decision support functions to growers using historical and real-time weather data and crop modeling technology to help with short- and long-term planning, thereby maximizing the efficiency of irrigation practices (UF/IFAS 2022). Currently, there are three FAWN stations (Palmdale, Clewiston, and Immokalee) supported by the SFWMD in the LWC Planning Area. Additional information for these stations is available at http://www.fawn.ifas.ufl.edu.

REGULATORY INITIATIVES

Regulations are excellent tools to assist in the implementation of better practices and more efficient devices. The SFWMD requires that water conservation measures and programs be considered for users with water use permits. For a proposed use of water to be deemed reasonable-beneficial, water users that require a permit must include a water conservation plan in the permit application. Section 2.3.2 of the *Applicant's Handbook for Water Use Permit Applications within the South Florida Water Management District* (SFWMD 2021b) includes specific water conservation requirements for various water use categories.

The SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, F.A.C.) was adopted to help protect South Florida's water resources by addressing landscape irrigation (the largest area of residential water use and greatest potential for viable water use reduction). In short, the rule limits landscape irrigation to 2 or 3 days per week, depending on location and local circumstances, and contains provisions for new landscaping and other situations that require a deviation from the rule requirements.

Adoption of local ordinances that comport with Chapter 40E-24, F.A.C. and associated outreach and education to residents, is crucial to reducing landscape irrigation water use. When local governments implement irrigation ordinances, it demonstrates a commitment to water resource protection through conservation.

To assist local governments in adopting such an ordinance, the SFWMD has created a model ordinance, a model code, and several customizable outreach materials designed to educate residents on their local irrigation ordinance. As of March 2022, 11 of 17 local governments within the LWC Planning Area had adopted a year-round irrigation ordinance. **Table 3-1** presents the list of governments in the LWC Planning Area and their ordinance adoption status. Additional information and example documents for local implementation are available on the SFWMD's website (https://www.sfwmd.gov/conserve).

Table 3-1. List of local governments in the LWC Planning Area and their irrigation ordinance adoption status.

Local Governments in the LWC Planning Area	Adopted Irrigation Ordinance	
	YES	NO
Bonita Springs, City of	×	
Cape Coral, City of	×	
Charlotte County*	×	
Clewiston, City of		×
Collier County	×	
Estero, Village of	×	
Everglades, City of	×	
Ft. Myers, City of	×	
Ft. Myers Beach, Town of		×
Glades County		×
Hendry County		×
LaBelle, City of		×
Lee County	×	
Marco Island, City of	×	
Moore Haven, City of		×
Naples, City of	×	
Sanibel, City of	×	

*Charlotte County follows the Southwest Florida Water Management District's irrigation restrictions.

POTENTIAL FOR WATER CONSERVATION SAVINGS

Potential water savings of 44.81 mgd for the LWC Planning Area were estimated for the following water use categories: Agriculture (AG), Public Supply (PS), Domestic Self-Supply (DSS), and Landscape/Recreational (L/R). **Table 3-2** summarizes prospective savings for each category. For the Commercial/Industrial/Institutional (CII) and Power Generation (PG) water use categories, potential water savings were estimated only for potable indoor water use, which was assumed to be provided by a PS utility. Therefore, those potential savings are accounted for under PS. The methods used to estimate the savings for each category are discussed in each subsection.

Agriculture

AG is the largest water use category in the LWC Planning Area, accounting for 62% (592 mgd) of the total demand in 2020 and is expected to rise to 619.92 mgd in 2045. In addition, irrigated AG acreage is projected to increase approximately 5% (from 291,765 acres in 2020 to 307,062 acres in 2045), suggesting that AG will continue to be the largest water use sector.

As discussed in **Chapter 2** and **Appendix A**, the annual Florida Statewide Agricultural Irrigation Demand (FSAID) report published by FDACS includes 20-year estimates and projections of agricultural acreage and water demands. Estimated efficiency improvement (i.e., conservation estimate) is one of the parameters calculated by the FSAID model, and the spatially based data that contribute to the water demand estimates and projections are available by water management district planning area. The potential AG conservation savings within the LWC Planning Area were determined using the FSAID geodatabase (https://www.fdacs.gov/Agriculture-Industry/Water/Agricultural-Water-Supply-Planning). The methodology for calculating the potential AG conservation savings is more fully described in Appendix E of the FSAID VIII report (FDACS 2021), but generally is based on estimated historical use determined from the United States Department of Agriculture's Farm and Ranch Irrigation Surveys and actual water savings data from MILs. The projected conservation savings are based primarily on irrigation system changes, changes in scheduling, and sensor-based automation.

The total savings calculated by the FSAID model for any given year depends on the crops produced, the acreage of each crop, and the irrigation systems employed, as projected to exist in that year. Because these variables change over the planning horizon (2020 to 2045), projected savings also change and may be nonlinear. The estimated conservation potential for the AG water use category in the LWC Planning Area in 2045 is 15.64 mgd (**Table 3-2**).

Public Supply and Domestic Self-Supply

PS is the second largest water use category in the LWC Planning Area and is projected to increase through the planning horizon. PS accounted for an estimated 120 mgd of finished water demand in 2020 and 162 mgd in 2045 projected demands (**Chapter 2**). DSS is estimated to have demands of 25 mgd in 2020 and projected to have 35 mgd in 2045. Historical conservation efforts in PS are reflected in the per capita use rate, which has declined approximately 30% between 2000 and 2020. This decline likely is the result of new construction using higher-efficiency fixtures and/or designed for more efficient water use, the SFWMD's Mandatory Year-Round Landscape Irrigation Conservation Measures Rule (Chapter 40E-24, F.A.C.), conservation rate structures, public education, and other conservation factors. Local and tribal governments are

encouraged to conduct educational outreach to promote and incentivize water conservation among DSS users.

Estimates of active and passive water conservation potential for each county in the LWC Planning Area were made for residential and non-residential users (in both PS service areas and DSS areas) using the Alliance for Water Efficiency Conservation Tracking Tool (AWE Tool), Version 4.0 (AWE 2021). The AWE Tool calculates active water savings for user-selected conservation measures based on the number of measures implemented annually over the planning horizon, and the per unit savings and service lives of each measure. Passive savings are generated by the AWE Tool based on natural replacement of toilets, showerheads, and water-using appliances at the end of their service lives, whose current or future minimum efficiency is dictated by national, state, or local code requirements. Baseline data include Florida Department of Revenue parcel information, University of Florida Bureau of Economic and Business Research household data and population projections, and Florida Department of Environmental Protection finished water monthly operating reports (as used in this plan update for demand projections; **Appendix A**). Conservation potential for DSS was analyzed with PS users and extracted in proportion to its percentage of the total population in each county.

For this 2022 LWC Plan Update, seven frequently implemented measures were selected and quantified to generate the potential water savings for PS and DSS. Conservation measures included in the estimates for residential users supplied by PS utilities and DSS users were limited to the following measures: high-efficiency toilets, showerheads, clothes washers, irrigation audits, landscape evaluations, advanced irrigation controllers, and water use audits. For many types of permit holders, including CII and PG, indoor potable water use often is provided by a PS utility. Conservation measures for non-residential users served by PS utilities included high-efficiency toilets and urinals.

For all measures, the conservation (demand reduction) estimate assumes a participation rate of 30% of the total annual potential implementations for each applicable measure. This assumption means 30% of all possible implementations would be accomplished over the planning horizon (2020 to 2045), which is thought to be an achievable participation rate for most conservation measures. The combined estimated conservation potential by PS and DSS (active and passive savings) in the LWC Planning Area in 2045 is 16.46 mgd (**Table 3-2**).

Landscape/Recreational

The L/R use category includes irrigation of landscaped areas such as parks, athletic fields, roadway medians, commercial spaces, large private residential properties, and golf courses. Because their demands are estimated in different ways, golf course potential water savings are discussed separately from other permitted landscape irrigation.

There are approximately 3,717 active landscape irrigation water use permits in the LWC Planning Area. Landscape irrigation is projected to use a total of 123 mgd in 2045. To estimate the potential water conservation savings for landscaped areas, a variety of irrigation efficiency measures were applied to 30% of the permits over the planning horizon, yielding a 7% savings. Assuming an average per permit use for each county, the estimated conservation potential for landscape irrigation in 2045 is 8.31 mgd.

Golf Courses

There are 128 active water use permits in the LWC Planning Area (58 in Collier County, 69 in Lee County, and 1 in Glades County) for golf course irrigation. Indoor potable water use at golf courses is assumed to be provided by a PS utility. There are no active golf course permits in the portions of Charlotte and Hendry counties within the LWC Planning Area boundary.

Irrigation demands for golf courses in the LWC Planning Area are projected to decrease by 13% as acreage devoted to golf courses is projected to go from 13,367 acres in 2020 to 13,170 acres in 2045. Most golf courses are irrigated with a high degree of efficiency. According to a 2019 statewide survey of Florida Golf Course Superintendents Association members, 55% of golf courses use advanced irrigation controllers (Irwin and Wanvestraut 2020). A conservation program would therefore aim to affect the golf courses not yet using advanced irrigation controllers.

To estimate the potential water conservation savings for golf courses, a variety of irrigation efficiency measures were applied to 30% of the 128 permitted golf courses over the planning horizon, yielding a 10% savings. Assuming an average per permit use for each county, the estimated conservation potential for golf courses in 2045 is 4.40 mgd and combined with the potential savings for landscape irrigation (8.31 mgd) is a total savings of 12.71 mgd for the L/R use category (**Table 3-2**).

Commercial/Industrial/Institutional

For CII permit holders, indoor potable water use is assumed to be provided by a PS utility. Therefore, conservation savings estimates were captured during the PS analysis by the measures targeting non-residential users (i.e., high-efficiency restroom fixtures and HVAC efficiency improvement measures). CII permitted water use was not analyzed for conservation potential as those uses were assumed to be process-specific and, therefore, difficult to estimate within the scope of a regional analysis.

Power Generation

PG facilities use large quantities of water for cooling, but most of the water is returned to the source from which it was obtained. As a result, there are minimal efficiency gains to be had from the cooling process. Potential savings for PG were not estimated as part of this analysis. As with the CII use category, indoor potable water use at PG facilities is assumed to be provided by a PS utility. Therefore, conservation savings estimates were captured during the PS analysis in the AWE Tool by the measures specifically targeting non-residential users (i.e., high-efficiency restroom fixtures and HVAC efficiency measures).

CONCLUSIONS

Table 3-2 summarizes potential water savings for the LWC Planning Area in all use categories using common water conservation measures. Greater conservation savings may be possible if additional measures are implemented or if increased participation rates are realized. Participation rates can be influenced by ineffective marketing and high implementation costs. The estimates presented in this report are conservative and not intended to represent the full conservation potential utilizing all measures available. Studies have found adoption of demand-side water conservation is highly variable (Rasoulkhani et al. 2018). A comprehensive list of conservation measures and applicable water use categories can be found in the *Support Document for the 2021-2024 Water Supply Plan Updates* (2021-2024 Support Document; SFWMD 2021a).

Table 3-2. Potential water saved (in mgd) in the LWC Planning Area based on demand reduction estimates achievable by 2045.

Use Category	County					2045 Total by Sector
	Charlotte[1]	Collier	Glades	Hendry	Lee	
Agriculture	1.35	5.51	2.02	4.72	2.04	15.64
Public Supply[2]	0.05	3.62	0.10	0.27	8.37	12.39
Domestic Self-Supply[2]	0.07	2.45	0.08	0.11	1.34	4.07
Landscape/Recreational[3]	0.17	5.25	0.02	0.06	7.21	12.71
Total	1.70	14.80	2.21	5.17	19.63	44.81

mgd = million gallons per day; LWC = Lower West Coast.

1 Values listed are only for the area within the LWC Planning Area boundary. There is only one public supply utility located in the portion of Charlotte County within the LWC Planning Area.

2 Includes passive savings.

3 Includes golf and landscape/recreational savings

Regional and local agencies should conduct thorough analyses of their service areas, allocate adequate funding to assist individual users to make the necessary investments in conservation, and reduce the need for more costly projects in the future. Cities and utilities should consider the use of conservation planning tools. A robust public outreach and education component is critical to the success of all conservation programs. Finally, District staff are available to assist conservation program developers with technical support, collaborative program implementation, ordinance review, and long-term demand management planning.

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